

PRUEBA DE HABILIDADES PRÁCTICAS

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA UNAD
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INGENIERIA DE TELECOMUNICACIONES
BOGOTÁ
2.019

PRUEBA DE HABILIDADES PRÁCTICAS

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Prueba de Habilidades Practicas CCNA para optar por el título de Ingeniero de
Telecomunicaciones

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BOGOTA

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INTRODUCCIÓN

Demostrar que se tienen las capacidades necesarias para ejercer la profesión de Ingenieros de Telecomunicaciones es de fundamental importancia para Universidad Nacional Abierta y a Distancia UNAD, por ello en el desarrollo de este trabajo se evidencia la comprensión y solución de problemas relacionado con diversos aspectos de Networking.

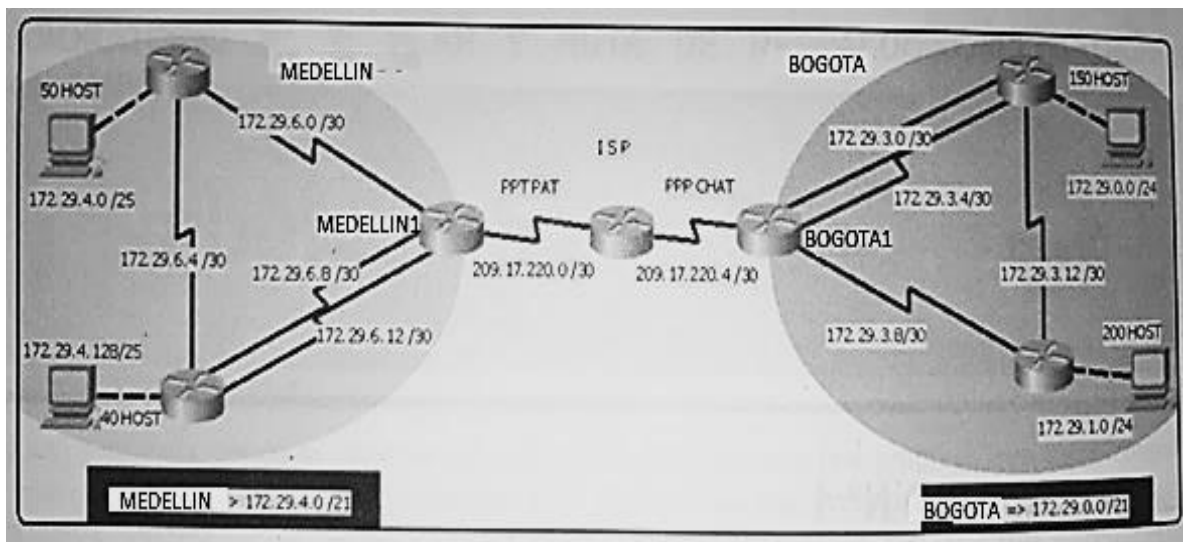
En dos escenarios, propuestos mediante la metodología de Aprendizaje Basado en Problemas (ABP), se demostrará la aprehensión de conocimientos y la adquisición de habilidades para el futuro desempeño como profesionales de las telecomunicaciones, así también se demuestra la destreza en el manejo de herramientas de simulación como Packet Tracer.

Por último es importante mencionar que las Telecomunicaciones son una rama las ingenierías que actualmente se encuentra en auge, lo que exige de los próximos profesionales el mayor compromiso e innovación, demostrando ser propositivo e ingenioso para exponer soluciones a diversas situaciones que puedan presentarse y que contribuyan al mejoramiento de la calidad de vida y la optimización de procesos.

1. DESARROLLO DE LOS ESCENARIOS

1.1. ESCENARIO 1

Una empresa posee sucursales distribuidas en las ciudades de Bogotá y Medellín, en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre sí cada uno de los dispositivos que forman parte del escenario, acorde con los lineamientos establecidos para el direccionamiento IP, protocolos de enrutamiento y demás aspectos que forman parte de la topología de red.



Este escenario plantea el uso de RIP como protocolo de enrutamiento, considerando que se tendrán rutas por defecto redistribuidas; asimismo, habilitar el encapsulamiento PPP y su autenticación.

Los routers Bogota2 y medellin2 proporcionan el servicio DHCP a su propia red LAN y a los routers 3 de cada ciudad.

Debe configurar PPP en los enlaces hacia el ISP, con autenticación.

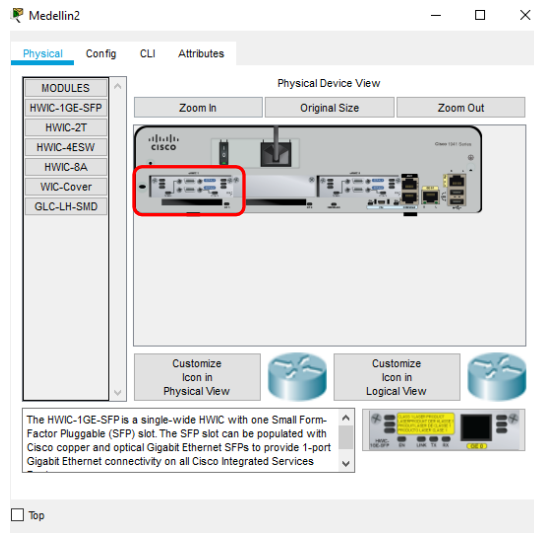
Debe habilitar NAT de sobrecarga en los routers Bogota1 y medellin1.

1.2. DESARROLLO

Como trabajo inicial se debe realizar lo siguiente.

Realizar las rutinas de diagnóstico y dejar los equipos listos para su configuración (asignar nombres de equipos, asignar claves de seguridad, etc).

- Se deben agregar puertos seriales



- Asignación de nombre

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Medellin1
```

- Asignación de contraseña EXEC privilegiado:

```
Medellin1>enable
Medellin1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Medellin1(config)#enable secret class
Medellin1(config)#exit
```

- Asignación de contraseñas de EXEC de usuario y líneas VTY

```
Medellin1(config)#line console 0
Medellin1(config-line)#password cisco
Medellin1(config-line)#login
Medellin1(config-line)#exit
Medellin1(config)#line vty 0 15
Medellin1(config-line)#password cisco
Medellin1(config-line)#login
Medellin1(config-line)#exit
```

- Cifrado de contraseñas

```
Medellin1(config)#service password-encryption
Medellin1(config)#exit
```

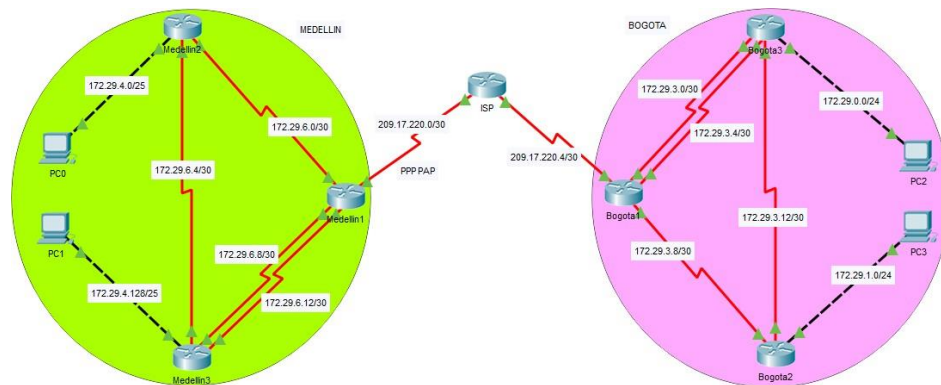
- Aviso de seguridad en la red

```
Medellin1#configure terminal
Medellin1(config)#banner motd #Solo acceso autorizado#
Medellin1(config)#exit
```

- Guardar configuraciones en NVRAM

```
Medellin1#copy running-config startup-config
```

Realizar la conexión física de los equipos con base en la topología de red



Configurar la topología de red, de acuerdo con las siguientes especificaciones.

1.2.1. Parte 1: Configuración de enrutamiento

- Configurar el enrutamiento en la red usando el protocolo RIP versión 2, declare la red principal, desactive la sumarización automática. RIP debe configurarse en las zonas Medellín y Bogotá porque en el ISP se utilizara otro protocolo de enrutamiento dinámico o estático.

- *Asignación de direcciones Ip's en ISP y enrutamiento RIP*

```
ISP(config)#int s0/1/1
ISP(config-if)#ip address 209.17.220.1 255.255.255.252
ISP(config-if)#clock rate 4000000
ISP(config-if)#no shutdown

ISP(config-if)#int s0/1/0
ISP(config-if)#ip address 209.17.220.5 255.255.255.252
ISP(config-if)#clock rate 4000000
ISP(config-if)#no shutdown
```

- *Asignación de direcciones Ip's en Medellin1 y enrutamiento RIP*

IP's

```
Medellin1(config)#int s0/0/1
Medellin1(config-if)#ip address 209.17.220.2 255.255.255.252
Medellin1(config-if)#no shutdown

Medellin1(config-if)#int s0/0/0
Medellin1(config-if)#ip address 172.29.6.1 255.255.255.252
Medellin1(config-if)#clock rate 4000000
Medellin1(config-if)#no shutdown

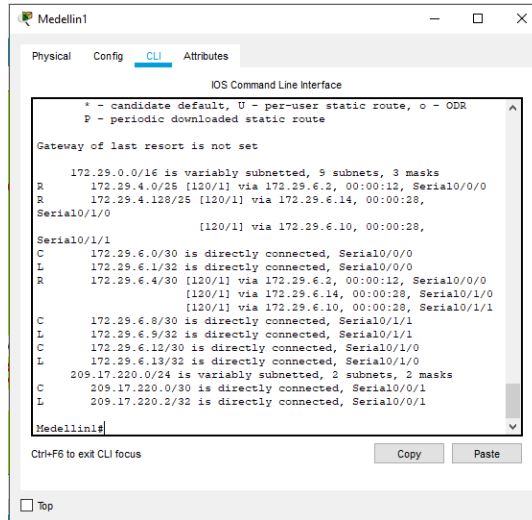
Medellin1(config-if)#int s0/1/1
Medellin1(config-if)#ip address 172.29.6.9 255.255.255.252
Medellin1(config-if)#clock rate 4000000
Medellin1(config-if)#no shutdown

Medellin1(config-if)#int s0/1/0
Medellin1(config-if)#ip address 172.29.6.13 255.255.255.252
Medellin1(config-if)#clock rate 4000000
Medellin1(config-if)#no shutdown
```

RIP

```
Medellin1(config)#router rip
Medellin1(config-router)#version 2
Medellin1(config-router)#no auto-summary
Medellin1(config-router)#do show ip route connected
C    172.29.6.0/30    is directly connected, Serial0/0/0 C
    172.29.6.8/30    is directly connected, Serial0/1/1 C
    172.29.6.12/30   is directly connected, Serial0/1/0
C    209.17.220.0/30  is directly connected, Serial0/0/1

Medellin1(config-router)#network 172.29.6.0
Medellin1(config-router)#network 172.29.6.8
Medellin1(config-router)#network 172.29.6.12
Medellin1(config-router)#passive-interface s0/0/1 (opcional)
```



- *Asignación de direcciones Ip's en Medellin2 y enrutamiento RIP*

IP's

```
Medellin2(config-if)#int s0/1/1
Medellin2(config-if)#ip address 172.29.6.5      255.255.255.252
Medellin2(config-if)#clock rate 4000000
Medellin2(config-if)#no shutdown

Medellin2(config)#int s0/1/0
Medellin2(config-if)#ip address 172.29.6.2      255.255.255.252
Medellin2(config-if)#no shutdown

Medellin2(config-if)#int g0/0 Medellin2(config-
if)#ip address 172.29.4.1      255.255.255.128
Medellin2(config-if)#no shutdown
```

RIP

```
Medellin2(config)#router rip Medellin2(config-
router)#version 2 Medellin2(config-router)#no
auto-summary
Medellin2(config-router)#do show ip route connected
C   172.29.4.0/25   is directly connected, GigabitEthernet0/0 C
    172.29.6.0/30   is directly connected, Serial0/1/0
C   172.29.6.4/30   is directly connected, Serial0/1/1

Medellin2(config-router)#network 172.29.4.0
Medellin2(config-router)#network 172.29.6.0
Medellin2(config-router)#network 172.29.6.4 Medellin2(config-
router)#passive-interface g0/0 (opcional)
```

- *Asignación de direcciones Ip's en Medellin3 y enrutamiento RIP*

IP's

```

Medellin3(config-if)#int s0/1/1
Medellin3(config-if)#ip address 172.29.6.10 255.255.255.252
Medellin3(config-if)#no shutdown

Medellin3(config)#int s0/1/0
Medellin3(config-if)#ip address 172.29.6.14 255.255.255.252
Medellin3(config-if)#no shutdown

Medellin3(config)#int s0/0/1
Medellin3(config-if)#ip address 172.29.6.6 255.255.255.252
Medellin3(config-if)#no shutdown

Medellin3(config-if)#int g0/0
Medellin3(config-if)#ip address 172.29.4.129 255.255.255.128
Medellin3(config-if)#no shutdown

```

RIP

```

Medellin3(config)#router rip Medellin3(config-
router)#version 2 Medellin3(config-router)#no
auto-summary
Medellin3(config-router)#do show ip route connected
C    172.29.4.128/25 is directly connected, GigabitEthernet0/0 C
    172.29.6.4/30   is directly connected, Serial0/0/1
C    172.29.6.8/30  is directly connected, Serial0/1/1 C
    172.29.6.12/30  is directly connected, Serial0/1/0

Medellin3(config-router)#network 172.29.4.128
Medellin3(config-router)#network 172.29.6.4
Medellin3(config-router)#network 172.29.6.8
Medellin3(config-router)#network 172.29.6.12 Medellin3(config-
router)#passive-interface g0/0 (opcional)

```

- *Asignación de direcciones Ip's en Bogota1 y enrutamiento RIP*

IP's

```

Bogota1(config)#int s0/0/0
Bogota1(config-if)#ip address 209.17.220.6 255.255.255.252
Bogota1(config-if)#no shutdown

Bogota1(config-if)#int s0/1/0
Bogota1(config-if)#ip address 172.29.3.1          255.255.255.252
Bogota1(config-if)#clock rate 4000000
Bogota1(config-if)#no shutdown

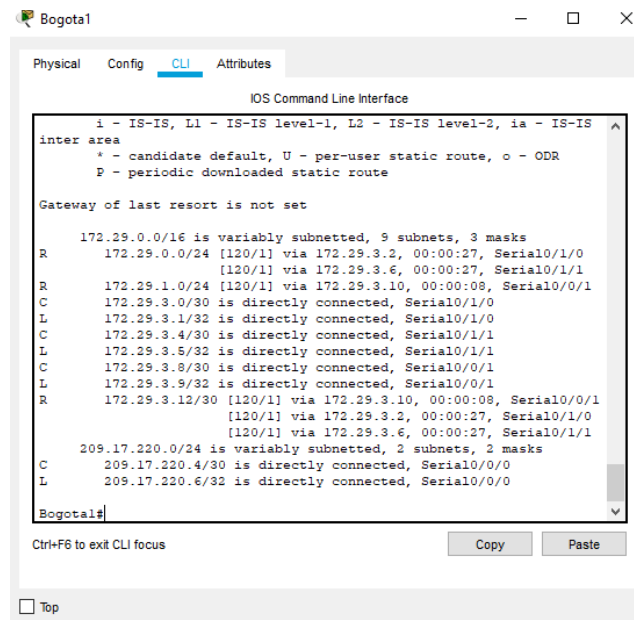
Bogota1(config-if)#int s0/1/1 Bogota1(config-
if)#ip address 172.29.3.5          255.255.255.252
Bogota1(config-if)#clock rate 4000000
Bogota1(config-if)#no shutdown

Bogota1(config)#int s0/0/1 Bogota1(config-
if)#ip address 172.29.3.9          255.255.255.252
Bogota1(config-if)#clock rate 4000000
Bogota1(config-if)#no shutdown

```

RIP

```
Bogota1(config)#router rip Bogota1(config-  
router)#version 2 Bogota1(config-  
router)#no auto-summary  
Bogota1(config-router)#do show ip route connected  
C 172.29.3.0/30 is directly connected, Serial0/1/0 C  
172.29.3.4/30 is directly connected, Serial0/1/1 C  
172.29.3.8/30 is directly connected, Serial0/0/1  
C 209.17.220.4/30 is directly connected, Serial0/0/0  
  
Bogota1(config-router)#network 172.29.3.0  
Bogota1(config-router)#network 172.29.3.4  
Bogota1(config-router)#network 172.29.3.8  
Bogota1(config-router)#passive-interface s0/0/0 (opcional)
```



- *Asignación de direcciones Ip's en Bogota2 y enrutamiento RIP*

IP's

```
Bogota2(config)#int s0/1/1  
Bogota2(config-if)#ip address 172.29.3.10 255.255.255.252  
Bogota2(config-if)#no shutdown  
  
Bogota2(config-if)#int s0/1/0  
Bogota2(config-if)#ip address 172.29.3.13 255.255.255.252  
Bogota2(config-if)#clock rate 4000000  
Bogota2(config-if)#no shutdown  
  
Bogota2(config-if)#int g0/0  
Bogota2(config-if)#ip address 172.29.1.1 255.255.255.0  
Bogota2(config-if)#no shutdown
```

RIP

```
Bogota2(config)#router rip Bogota2(config-  
router)#version 2 Bogota2(config-  
router)#no auto-summary  
Bogota2(config-router)#do show ip route connected  
C 172.29.1.0/24 is directly connected, GigabitEthernet0/0 C  
172.29.3.8/30 is directly connected, Serial0/1/1  
C 172.29.3.12/30 is directly connected, Serial0/1/0  
  
Bogota2(config-router)# network 172.29.1.0  
Bogota2(config-router)# network 172.29.3.8  
Bogota2(config-router)# network 172.29.3.12 Bogota2(config-  
router)#passive-interface g0/0 (opcional)
```

- *Asignación de direcciones Ip's en Bogota3 y enrutamiento RIP*

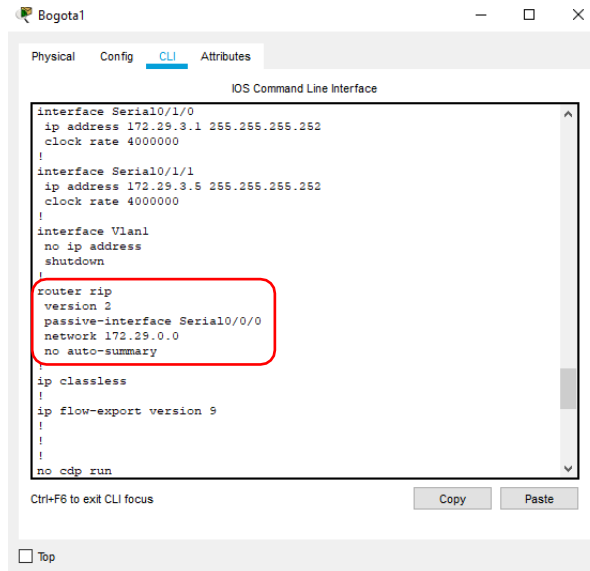
IP's

```
Bogota3(config)#int s0/0/1  
Bogota3(config-if)#ip address 172.29.3.14 255.255.255.252  
Bogota3(config-if)#no shutdown  
  
Bogota3(config-if)#int s0/1/1  
Bogota3(config-if)#ip address 172.29.3.6 255.255.255.252  
Bogota3(config-if)#no shutdown  
  
Bogota3(config-if)#int s0/1/0 Bogota3(config-  
if)#ip address 172.29.3.2 255.255.255.252  
Bogota3(config-if)#no shutdown  
  
Bogota3(config-if)#int g0/0 Bogota3(config-  
if)#ip address 172.29.0.1 255.255.255.0  
Bogota3(config-if)#no shutdown
```

RIP

```
Bogota3(config)#router rip Bogota3(config-  
router)#version 2 Bogota3(config-  
router)#no auto-summary  
Bogota3(config-router)#do show ip route connected  
C 172.29.0.0/24 is directly connected, GigabitEthernet0/0 C  
172.29.3.0/30 is directly connected, Serial0/1/0  
C 172.29.3.4/30 is directly connected, Serial0/1/1 C  
172.29.3.12/30 is directly connected, Serial0/0/1  
  
Bogota3(config-router)#network 172.29.0.0  
Bogota3(config-router)#network 172.29.3.0  
Bogota3(config-router)#network 172.29.3.4  
Bogota3(config-router)#network 172.29.3.12 (opcional)
```

- b) Los routers Bogota1 y Medellín deberán añadir a su configuración de enrutamiento una ruta por defecto hacia el ISP y, a su vez, redistribuirla dentro de las publicaciones de RIP.



RUTA POR DEFECTO

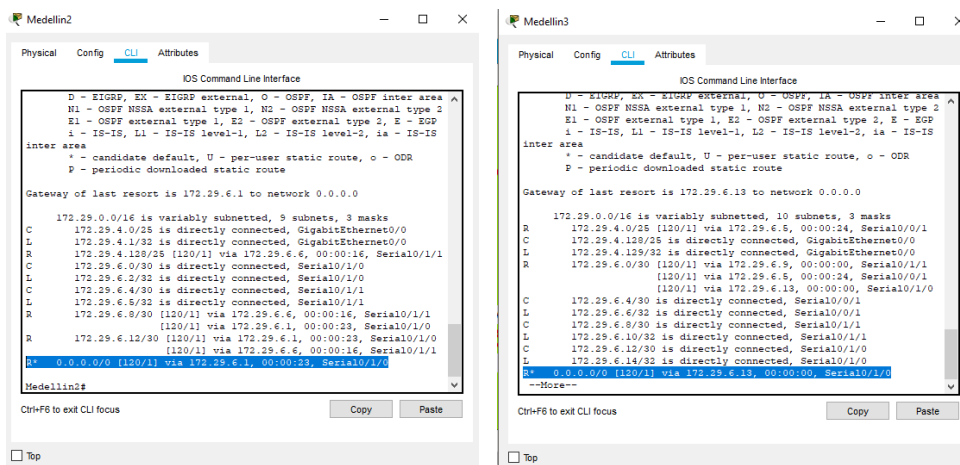
```

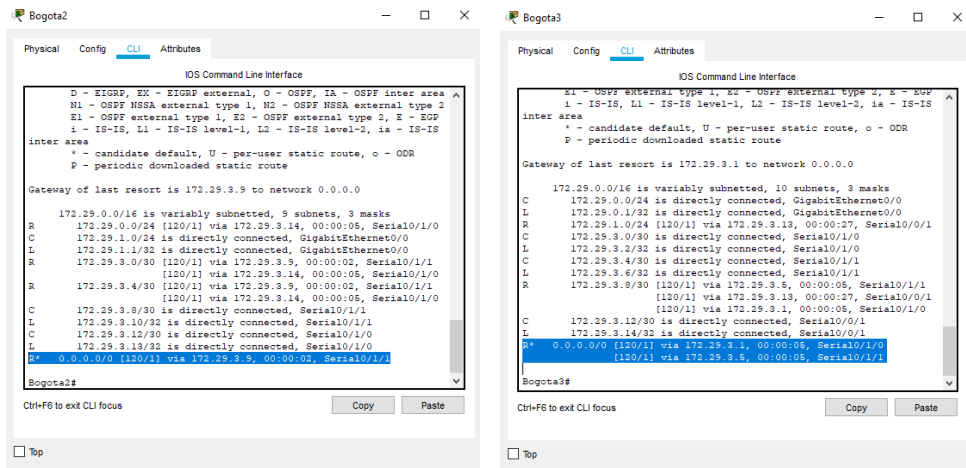
Medellin1(config)#ip route 0.0.0.0 0.0.0.0 209.17.220.1
Medellin1(config)#router rip
Medellin1(config-router)#default-information originate

Bogota1(config)#ip route 0.0.0.0 0.0.0.0 209.17.220.5
Bogota1(config)#router rip
Bogota1(config-router)#default-information originate

```

Para comprobar se hace un show ip route desde los otros router, así se verifica que ya conocen una ruta por la cual conectar a internet.





- c) El router ISP deberá tener una ruta estática dirigida hacia cada red interna de Bogotá y Medellín para el caso se sumarian las subredes de cada uno a /22.

- *Sumarización de la red Medellín*

172	29	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	172.29.4.0/25
172	29	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	172.29.4.128/25
172	29	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	172.29.6.0/30
172	29	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	172.29.6.4/30
172	29	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	172.29.6.8/30
172	29	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	172.29.6.12/30
172	29	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	172.29.4.0/22

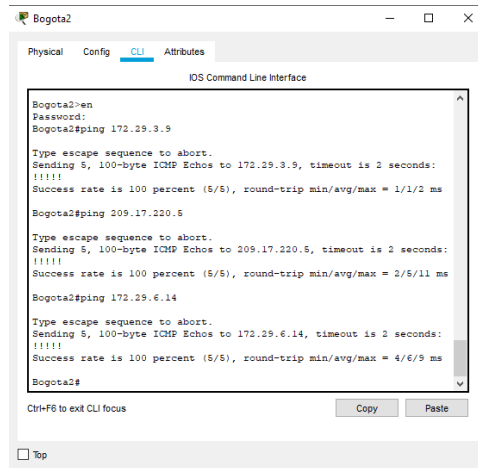
- *Sumarización de la red Bogotá*

172	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172.29.0.0/24
172	29	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	172.29.1.0/24
172	29	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	172.29.3.0/30
172	29	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	172.29.3.4/30
172	29	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	172.29.3.8/30
172	29	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	172.29.3.12/30
172	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172.29.0.0/22

Entonces en el ISP se debe configurar teniendo en cuenta las direcciones 172.29.4.0 con máscara de subred 255.255.252.0 para Medellín y 172.29.4.0 con máscara de subred 255.255.252.0 para Bogotá.

```
ISP(config)#ip route 172.29.4.0 255.255.252.0 209.17.220.2
ISP(config)#ip route 172.29.0.0 255.255.252.0 209.17.220.6
```

Comprobando



```
Bogota2#
Bogota2#ping 172.29.3.9
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.29.3.9, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
Bogota2#ping 209.17.220.5
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.5, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/5/11 ms
Bogota2#ping 172.29.6.14
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.29.6.14, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/6/9 ms
Bogota2#
```

1.2.2. Parte 2: Tabla de Enrutamiento

- a) Verificar la tabla de enrutamiento en cada uno de los routers para comprobar las redes y sus rutas.

ISP

Medellín

Medellin1

Physical Config CLI Attributes

IOS Command Line Interface

```
# - periodic downloaded static route

Gateway of last resort is 209.17.220.1 to network 0.0.0.0

R 172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R 172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:23, Serial0/0/0
R 172.29.4.128/25 [120/1] via 172.29.6.10, 00:00:22,
Serial0/1/1
[120/1] via 172.29.6.14, 00:00:22,
Serial0/1/0
C 172.29.6.0/30 is directly connected, Serial0/0/0
L 172.29.6.1/32 is directly connected, Serial0/0/0
R 172.29.6.4/30 [120/1] via 172.29.6.10, 00:00:22, Serial0/1/1
[120/1] via 172.29.6.2, 00:00:23, Serial0/0/0
[120/1] via 172.29.6.14, 00:00:22, Serial0/1/0
C 172.29.6.8/30 is directly connected, Serial0/1/1
L 172.29.6.9/32 is directly connected, Serial0/1/1
C 172.29.6.12/30 is directly connected, Serial0/1/0
L 172.29.6.13/32 is directly connected, Serial0/1/0
L 209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
C 209.17.220.0/30 is directly connected, Serial0/0/1
L 209.17.220.2/32 is directly connected, Serial0/0/1
S* 0.0.0.0/0 [1/0] via 209.17.220.1

Medellin1#
```

Ctrl+F6 to exit CLI focus

Copy Paste

☐ Top

Medellin2

Physical Config CLI Attributes

IOS Command Line Interface

```
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.6.1 to network 0.0.0.0

R 172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
C 172.29.4.0/25 is directly connected, GigabitEthernet0/0
L 172.29.4.1/32 is directly connected, GigabitEthernet0/0
R 172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:07, Serial0/1/1
C 172.29.6.0/30 [120/1] via 172.29.6.6, 00:00:07, Serial0/1/0
L 172.29.6.2/32 is directly connected, Serial0/1/0
C 172.29.6.4/30 is directly connected, Serial0/1/1
L 172.29.6.5/32 is directly connected, Serial0/1/1
R 172.29.6.8/30 [120/1] via 172.29.6.1, 00:00:07, Serial0/1/1
[120/1] via 172.29.6.1, 00:00:07, Serial0/1/0
R 172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:07, Serial0/1/0
[120/1] via 172.29.6.6, 00:00:07, Serial0/1/1
R* 0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:07, Serial0/1/0

Medellin2#
```

Ctrl+F6 to exit CLI focus

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Medellin3

Physical Config CLI Attributes

IOS Command Line Interface

```
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.6.13 to network 0.0.0.0

R 172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R 172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:22, Serial0/0/1
C 172.29.4.128/25 is directly connected, GigabitEthernet0/0
L 172.29.4.129/32 is directly connected, GigabitEthernet0/0
R 172.29.6.0/30 [120/1] via 172.29.6.5, 00:00:17, Serial0/1/1
[120/1] via 172.29.6.5, 00:00:22, Serial0/0/1
[120/1] via 172.29.6.13, 00:00:17, Serial0/1/0
C 172.29.6.4/30 is directly connected, Serial0/0/1
L 172.29.6.6/32 is directly connected, Serial0/0/1
C 172.29.6.8/30 is directly connected, Serial0/1/1
L 172.29.6.10/32 is directly connected, Serial0/1/1
C 172.29.6.12/30 is directly connected, Serial0/1/0
L 172.29.6.14/32 is directly connected, Serial0/1/0
R* 0.0.0.0/0 [120/1] via 172.29.6.13, 00:00:17, Serial0/1/0
[120/1] via 172.29.6.9, 00:00:17, Serial0/1/1

Medellin3#
```

Ctrl+F6 to exit CLI focus

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Bogotá

Bogota1

Physical Config CLI Attributes

IOS Command Line Interface

```
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 209.17.220.5 to network 0.0.0.0

R 172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R 172.29.0.0/24 [120/1] via 172.29.3.6, 00:00:09, Serial0/1/1
[120/1] via 172.29.3.2, 00:00:09, Serial0/1/0
R 172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:16, Serial0/0/1
C 172.29.3.0/30 is directly connected, Serial0/1/0
L 172.29.3.1/32 is directly connected, Serial0/1/0
C 172.29.3.4/30 is directly connected, Serial0/1/1
L 172.29.3.5/32 is directly connected, Serial0/1/1
C 172.29.3.8/30 is directly connected, Serial0/0/1
L 172.29.3.9/32 is directly connected, Serial0/0/1
R 172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:16, Serial0/0/1
[120/1] via 172.29.3.6, 00:00:09, Serial0/1/1
[120/1] via 172.29.3.2, 00:00:09, Serial0/1/0
C 209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
C 209.17.220.4/30 is directly connected, Serial0/0/0
L 209.17.220.6/32 is directly connected, Serial0/0/0
S* 0.0.0.0/0 [1/0] via 209.17.220.5

Bogota1#
```

Ctrl+F6 to exit CLI focus

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Bogota2

Physical Config CLI Attributes

IOS Command Line Interface

```
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.3.9 to network 0.0.0.0

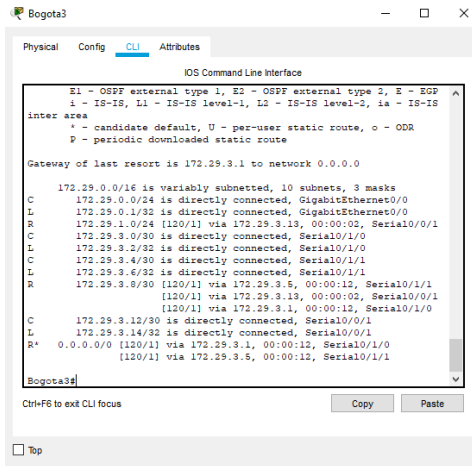
R 172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R 172.29.0.0/24 [120/1] via 172.29.3.14, 00:00:23, Serial0/1/0
C 172.29.1.0/24 is directly connected, GigabitEthernet0/0
L 172.29.1.1/32 is directly connected, GigabitEthernet0/0
R 172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:13, Serial0/1/1
[120/1] via 172.29.3.14, 00:00:23, Serial0/1/0
R 172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:13, Serial0/1/1
[120/1] via 172.29.3.14, 00:00:23, Serial0/1/0
C 172.29.3.8/30 is directly connected, Serial0/1/1
L 172.29.3.10/32 is directly connected, Serial0/1/1
C 172.29.3.12/30 is directly connected, Serial0/1/0
L 172.29.3.13/32 is directly connected, Serial0/1/0
R* 0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:13, Serial0/1/1

Bogota2#
```

Ctrl+F6 to exit CLI focus

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b) Verificar el balanceo de carga que presentan los routers.

Se presenta en los routers que comparten Medellín3 y Bogotá3, donde para acceder a internet tienen dos interfaces.

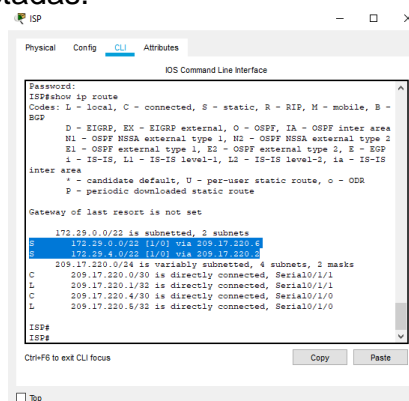
c) Obsérvese en los routers Bogotá1 y Medellín1 cierta similitud por su ubicación, por tener dos enlaces de conexión hacia otro router y por la ruta por defecto que manejan.

d) Los routers Medellín2 y Bogotá2 también presentan redes conectadas directamente y recibidas mediante RIP.

e) Las tablas de los routers restantes deben permitir visualizar rutas redundantes para el caso de la ruta por defecto.

Son las que se especificaron en el punto b, donde se halle más de una ruta para acceder a internet.

f) El router ISP solo debe indicar sus rutas estáticas adicionales a las directamente conectadas.



1.2.3. Parte 3: Desactivar la propagación del protocolo RIP

- a) Para no propagar las publicaciones por interfaces que no lo requieran se debe deshabilitar la propagación del protocolo RIP, en la siguiente tabla se indican las interfaces de cada router que no necesitan desactivación.

ROUTER	INTERFAZ
Bogota1	SERIAL0/0/1; SERIAL0/1/0; SERIAL0/1/1
Bogota2	SERIAL0/0/0; SERIAL0/0/1
Bogota3	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/0
Medellín1	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/1
Medellín2	SERIAL0/0/0; SERIAL0/0/1
Medellín3	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/0
ISP	No lo requiere

1.2.4. Parte 4: Verificación del protocolo RIP

- a) Verificar y documentar las opciones de enrutamiento configuradas en los routers, como el passive interface para la conexión hacia el ISP, la versión de RIP y las interfaces que participan de la publicación entre otros datos. Las siguientes interfaces fueron configuradas como interfaces pasivas, (este aspecto se documentó en pasos anteriores)
- s/0/0/1 Medellín1 que conecta con ISP
- s0/0/0 Bogota1 que conecta con ISP
- Al estar conectados al ISP su configuración se hacía con un protocolo diferente a RIP.
- G0/0 Bogota2, G0/0 Bogota3, G0/0 Medellín2, G0/0 Medellín3 también se configuraron pasivas porque en sus terminales no conectan con ningún otro router.
- b) Verificar y documentar la base de datos de RIP de cada router, donde se informa de manera detallada de todas las rutas hacia cada red.

MEDELLIN1

Gateway of last resort is not set

```
172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R    172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:10, Serial0/0/0
R    172.29.4.128/25 [120/1] via 172.29.6.14, 00:00:09, Serial0/1/0
      [120/1] via 172.29.6.10, 00:00:09, Serial0/1/1
C    172.29.6.0/30 is directly connected, Serial0/0/0 L
      172.29.6.1/32 is directly connected, Serial0/0/0
R    172.29.6.4/30 [120/1] via 172.29.6.2, 00:00:10, Serial0/0/0
      [120/1] via 172.29.6.14, 00:00:09, Serial0/1/0
      [120/1] via 172.29.6.10, 00:00:09, Serial0/1/1
C    172.29.6.8/30 is directly connected, Serial0/1/1 L
      172.29.6.9/32 is directly connected, Serial0/1/1 C
      172.29.6.12/30 is directly connected, Serial0/1/0 L
      172.29.6.13/32 is directly connected, Serial0/1/0
209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks C
      209.17.220.0/30 is directly connected, Serial0/0/1
L    209.17.220.2/32 is directly connected, Serial0/0/1
```

MEDELLIN2

Gateway of last resort is not set

```
172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
C    172.29.4.0/25 is directly connected, GigabitEthernet0/0 L
      172.29.4.1/32 is directly connected, GigabitEthernet0/0
R    172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:10, Serial0/1/1
C    172.29.6.0/30 is directly connected, Serial0/1/0 L
172.29.6.2/32 is directly connected, Serial0/1/0 C
172.29.6.4/30 is directly connected, Serial0/1/1 L 172.29.6.5/32
is directly connected, Serial0/1/1
R    172.29.6.8/30 [120/1] via 172.29.6.1, 00:00:09, Serial0/1/0
      [120/1] via 172.29.6.6, 00:00:10, Serial0/1/1 R
      172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:09, Serial0/1/0
      [120/1] via 172.29.6.6, 00:00:10, Serial0/1/1
```

MEDELLIN3

Gateway of last resort is not set

```
172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R    172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:23, Serial0/0/1
C    172.29.4.128/25 is directly connected, GigabitEthernet0/0 L
      172.29.4.129/32 is directly connected, GigabitEthernet0/0 R
      172.29.6.0/30 [120/1] via 172.29.6.5, 00:00:23, Serial0/0/1
      [120/1] via 172.29.6.13, 00:00:24, Serial0/1/0
      [120/1] via 172.29.6.9, 00:00:24, Serial0/1/1
C    172.29.6.4/30 is directly connected, Serial0/0/1 L
      172.29.6.6/32 is directly connected, Serial0/0/1 C
      172.29.6.8/30 is directly connected, Serial0/1/1 L
      172.29.6.10/32 is directly connected, Serial0/1/1 C
      172.29.6.12/30 is directly connected, Serial0/1/0 L
      172.29.6.14/32 is directly connected, Serial0/1/0
```

BOGOTA1

Gateway of last resort is not set

```

      172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.6, 00:00:08, Serial0/1/1
      [120/1] via 172.29.3.2, 00:00:08, Serial0/1/0
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:07, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/1/0
L       172.29.3.1/32 is directly connected, Serial0/1/0
C       172.29.3.4/30 is directly connected, Serial0/1/1
L       172.29.3.5/32 is directly connected, Serial0/1/1
C       172.29.3.8/30 is directly connected, Serial0/0/1
L       172.29.3.9/32 is directly connected, Serial0/0/1
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:07, Serial0/0/1
      [120/1] via 172.29.3.6, 00:00:08, Serial0/1/1
      [120/1] via 172.29.3.2, 00:00:08, Serial0/1/0
      209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
C       209.17.220.4/30 is directly connected, Serial0/0/0
L       209.17.220.6/32 is directly connected, Serial0/0/0
```

BOGOTA2

Gateway of last resort is not set

```

      172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.14, 00:00:00, Serial0/1/0
C       172.29.1.0/24 is directly connected, GigabitEthernet0/0
L       172.29.1.1/32 is directly connected, GigabitEthernet0/0
R       172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:27, Serial0/1/1
      [120/1] via 172.29.3.14, 00:00:00, Serial0/1/0
R       172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:27, Serial0/1/1
      [120/1] via 172.29.3.14, 00:00:00, Serial0/1/0
C       172.29.3.8/30 is directly connected, Serial0/1/1
L       172.29.3.10/32 is directly connected, Serial0/1/1
C       172.29.3.12/30 is directly connected, Serial0/1/0
      172.29.3.13/32 is directly connected, Serial0/1/0
```

BOGOTA3

Gateway of last resort is not set

```

      172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
C       172.29.0.0/24 is directly connected, GigabitEthernet0/0
L       172.29.0.1/32 is directly connected, GigabitEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:17, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/1/0
L       172.29.3.2/32 is directly connected, Serial0/1/0
C       172.29.3.4/30 is directly connected, Serial0/1/1
L       172.29.3.6/32 is directly connected, Serial0/1/1
R       172.29.3.8/30 [120/1] via 172.29.3.5, 00:00:11, Serial0/1/1
      [120/1] via 172.29.3.1, 00:00:11, Serial0/1/0
      [120/1] via 172.29.3.13, 00:00:17, Serial0/0/1
C       172.29.3.12/30 is directly connected, Serial0/0/1
L       172.29.3.14/32 is directly connected, Serial0/0/1
```

1.2.5. Parte 5: Configurar el encapsulamiento y autenticación PPP

- a) Según la topología se requiere que el enlace Medellín1 con ISP sea configurado con autenticación PAP.

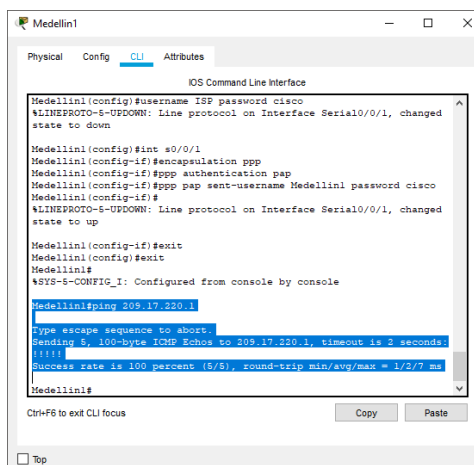
Como ya se habían asignado los nombres de cada router, se procede a introducir los siguientes comandos para activar la autenticación PAP entre ISP y Medellín1.

PAP

```
ISP(config)#username Medellín1 password cisco
ISP(config)#in s0/1/1
ISP(config-if)#encapsulation ppp
ISP(config-if)#
ISP(config-if)#ppp authentication pap
ISP(config-if)#ppp pap sent-username ISP password cisco

Medellin1(config)#username ISP password cisco
Medellin1(config)#int s0/0/1 Medellin1(config-
if)#encapsulation ppp Medellin1(config-if)#ppp
authentication pap
Medellin1(config-if)#ppp pap sent-username Medellín1 password cisco
```

Se comprueba haciendo ping



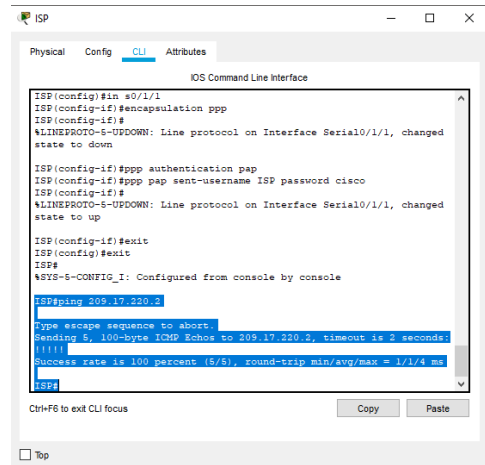
```
Medellin1
Physical Config CLI Attributes
IOS Command Line Interface

Medellin1(config)#username ISP password cisco
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed
state to down

Medellin1(config)#int s0/0/1
Medellin1(config-if)#encapsulation ppp
Medellin1(config-if)#ppp authentication pap
Medellin1(config-if)#ppp pap sent-username Medellín1 password cisco
Medellin1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed
state to up

Medellin1(config-if)#exit
Medellin1(config)#exit
Medellin1#
%SYS-5-CONFIG_I: Configured from console by console

Medellin1#ping 209.17.320.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.320.1, timeout is 3 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/7 ms
Medellin1#
```



```
ISP
Physical Config CLI Attributes
IOS Command Line Interface

ISP(config)#in s0/1/1
ISP(config-if)#encapsulation ppp
ISP(config-if)#
ISP(config-if)#ppp authentication pap
ISP(config-if)#ppp pap sent-username ISP password cisco
ISP(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed
state to up

ISP(config-if)#exit
ISP(config)#exit
ISP#
%SYS-5-CONFIG_I: Configured from console by console

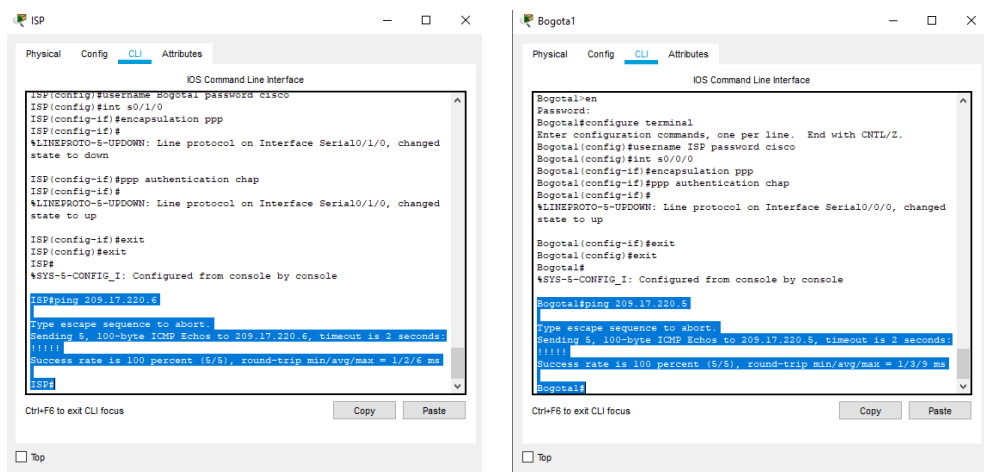
ISP#ping 209.17.320.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.320.3, timeout is 3 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
ISP#
```

- b) El enlace Bogotá1 con ISP se debe configurar con autenticación CHAP.

CHAP

```
ISP(config)#username Bogota1 password cisco
ISP(config)#int s0/1/0
ISP(config-if)#encapsulation ppp ISP(config-
if)#ppp authentication chap

Bogota1(config)#username ISP password cisco
Bogota1(config)#int s0/0/0
Bogota1(config-if)#encapsulation ppp
Bogota1(config-if)#ppp authentication chap
```



1.2.6. Parte 6: Configuración de PAT

- a) En la topología, si se activa NAT en cada equipo de salida (Bogotá1 y Medellín1), los routers internos de una ciudad no podrán llegar hasta los routers internos en el otro extremo, sólo existirá comunicación hasta los routers Bogotá1, ISP y Medellín1.

En este caso antes de proceder a la configuración, cabe resaltar que la listas de acceso se reducen a la dirección general de la red que se calculó en la sumariación de las redes, las cuales son Medellín 172.29.4.0/22 y Bogotá 172.29.0.0/22.

```

Medellin1(config)#ip nat inside source list 1 interface s0/0/1 overload
Medellin1(config)#access-list 1 permit 172.29.4.0 0.0.3.255
Medellin1(config)#int s0/0/1
Medellin1(config-if)#ip nat outside
Medellin1(config-if)#int s0/0/0
Medellin1(config-if)#ip nat inside
Medellin1(config-if)#int s0/1/1
Medellin1(config-if)#ip nat inside
Medellin1(config-if)#int s0/1/0
Medellin1(config-if)#ip nat inside

Bogota1(config)#ip nat inside source list 1 interface s0/0/0 overload
Bogota1(config)#access-list 1 permit 172.29.0.0 0.0.3.255
Bogota1(config)#int s0/0/0
Bogota1(config-if)#ip nat outside
Bogota1(config-if)#int s0/1/0
Bogota1(config-if)#ip nat inside
Bogota1(config-if)#int s0/0/1
Bogota1(config-if)#ip nat inside
Bogota1(config-if)#int s0/1/1
Bogota1(config-if)#ip nat inside

```

Haciendo *ping* desde los pc de cada red al ISP exitosos.

```

PC2
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 209.17.220.5

Pinging 209.17.220.5 with 32 bytes of data:

Reply from 209.17.220.5: bytes=32 time=42ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Reply from 209.17.220.5: bytes=32 time=14ms TTL=253
Reply from 209.17.220.5: bytes=32 time=6ms TTL=253

Ping statistics for 209.17.220.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 42ms, Average = 16ms

C:\>

```

```

PC1
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 209.17.220.1

Pinging 209.17.220.1 with 32 bytes of data:

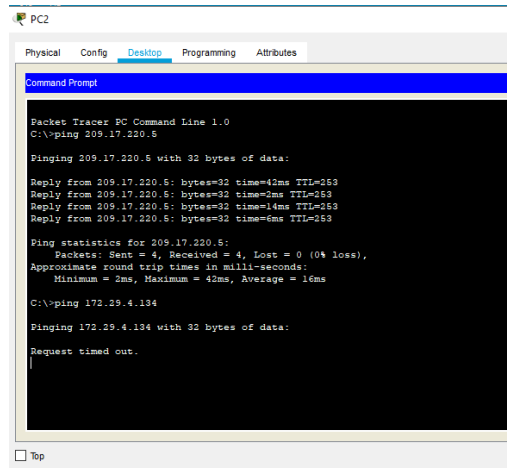
Reply from 209.17.220.1: bytes=32 time=2ms TTL=253
Reply from 209.17.220.1: bytes=32 time=10ms TTL=253
Reply from 209.17.220.1: bytes=32 time=12ms TTL=253
Reply from 209.17.220.1: bytes=32 time=4ms TTL=253

Ping statistics for 209.17.220.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 12ms, Average = 7ms

C:\>

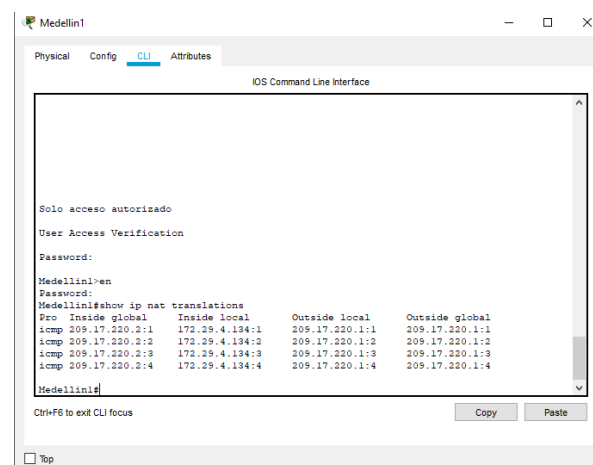
```

Y si se hace ping entre PC de diferente red el ping falla porque esa es la función de PAT. Para que puedan volver a comunicarse bastaría con desactivar NAT.



```
PC2
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 209.17.220.5
Pinging 209.17.220.5 with 32 bytes of data:
Reply from 209.17.220.5: bytes=32 time=43ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Reply from 209.17.220.5: bytes=32 time=14ms TTL=253
Reply from 209.17.220.5: bytes=32 time=6ms TTL=253
Ping statistics for 209.17.220.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 43ms, Average = 16ms
C:\>ping 172.29.4.134
Pinging 172.29.4.134 with 32 bytes of data:
Request timed out.
```

- b) Después de verificar lo indicado en el paso anterior proceda a configurar el NAT en el router Medellín1. Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de ping, la dirección debe ser traducida automáticamente a la dirección de la interfaz serial 0/1/0 del router Medellín1, cómo diferente puerto.
- Haciendo *show ip nat translation* se comprueba su correcto funcionamiento, pues los puertos cambian con cada conexión.
- c) Proceda a configurar el NAT en el router Bogotá1. Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de ping, la dirección debe ser traducida automáticamente a la dirección de la interfaz serial 0/1/0 del router Bogotá1, cómo diferente puerto.



```
Medellin1
Physical Config CLI Attributes
IOS Command Line Interface

Solo acceso autorizado
User Access Verification
Password:
Medellin1>en
Medellin1#show ip nat translations
Pro Inside global Inside local Outside local Outside global
icmp 209.17.220.2:1 172.29.4.134:1 209.17.220.1:1 209.17.220.1:1
icmp 209.17.220.2:2 172.29.4.134:2 209.17.220.1:2 209.17.220.1:2
icmp 209.17.220.2:3 172.29.4.134:3 209.17.220.1:3 209.17.220.1:3
icmp 209.17.220.2:4 172.29.4.134:4 209.17.220.1:4 209.17.220.1:4
Medellin1#
```

1.2.7. Parte 7: Configuración del servicio DHCP

- a) Configurar la red Medellín2 y Medellín3 donde el router Medellín 2 debe ser el servidor DHCP para ambas redes Lan.

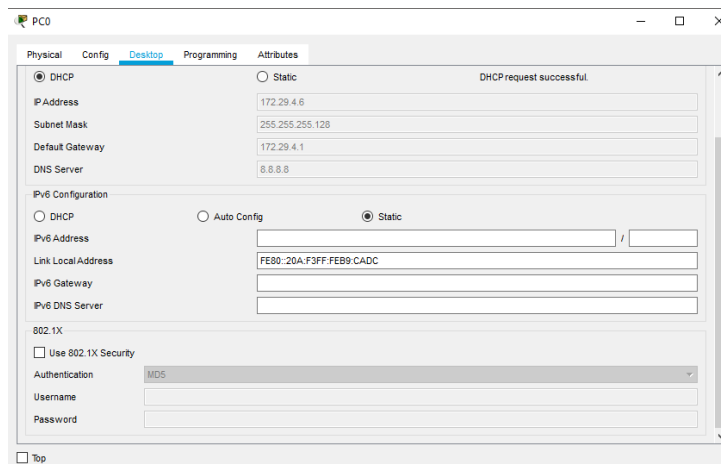
Lo primero que debemos hacer es crear un grupo de direcciones que serán excluidas de asignarse a posibles host

```
Medellin2(config)#ip dhcp excluded-address 172.29.4.1 172.29.4.5  
Medellin2(config)#ip dhcp excluded-address 172.29.4.129 172.29.4.133
```

Se deben crear el pool o banco de direcciones disponibles para ser usadas

```
Medellin2(config)#ip dhcp pool Med2  
Medellin2(dhcp-config)#network 172.29.4.0 255.255.255.128  
Medellin2(dhcp-config)#default-router 172.29.4.1  
Medellin2(dhcp-config)#dns-server 8.8.8.8  
Medellin2(dhcp-config)#exit  
  
Medellin2(config)#ip dhcp pool Med3  
Medellin2(dhcp-config)#network 172.29.4.128 255.255.255.128  
Medellin2(dhcp-config)#default-router 172.29.4.129  
Medellin2(dhcp-config)#dns-server 8.8.8.8  
Medellin2(dhcp-config)#exit
```

Ahora se debe configurar la pc como DHCP

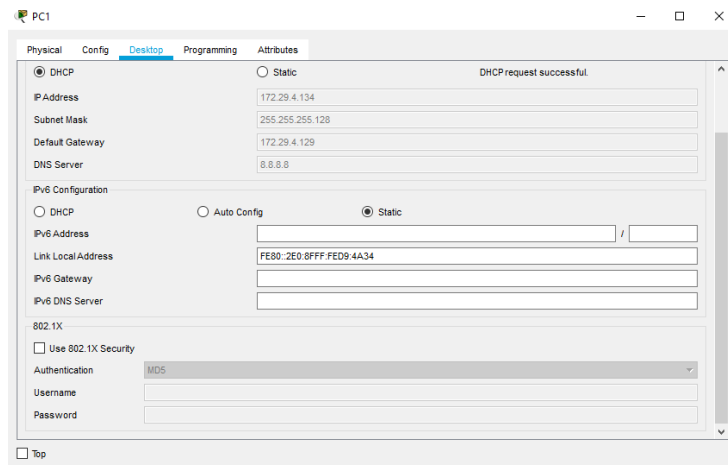


- b) El router Medellín3 deberá habilitar el paso de los mensajes broadcast hacia la IP del router Medellín2.

Para que la PC1 pueda acceder a una dirección DHCP debemos configurar un enlace entre Medellín3 y Medellín2 que es el servidor.

```
Medellin3(config)#int g0/0
Medellin3(config-if)#ip helper-address 172.29.6.5
```

Comprobando



- c) Configurar la red Bogotá2 y Bogotá3 donde el router Bogota2 debe ser el servidor DHCP para ambas redes Lan.
- d) Configure el router Bogotá1 para que habilite el paso de los mensajes Broadcast hacia la IP del router Bogotá2.
- para solucionar estos dos ítems, se repite el proceso anterior para esta parte de la red

```
Bogota2(config)#ip dhcp excluded-address 172.29.1.1 172.29.1.5
Bogota2(config)#ip dhcp excluded-address 172.29.0.1 172.29.0.5
Bogota2(config)#ip dhcp pool Bog2
Bogota2(dhcp-config)#network 172.29.1.0 255.255.255.0
Bogota2(dhcp-config)#default-router 172.29.1.1
Bogota2(dhcp-config)#dns-server 8.8.8.8
Bogota2(dhcp-config)#ip dhcp pool Bog3
Bogota2(dhcp-config)#network 172.29.0.0 255.255.255.0
Bogota2(dhcp-config)#default-router 172.29.0.1
Bogota2(dhcp-config)#dns-server 8.8.8.8
```

```
Bogota3(config)#int g0/0
Bogota3(config-if)#ip helper-address 172.29.3.13
```

Comprobando

PC2

Physical Config Desktop Programming Attributes

☒ DHCP

☐ Static

DHCP request successful.

IP Address

172.29.0.6

Subnet Mask

255.255.255.0

Default Gateway

172.29.0.1

DNS Server

8.8.8.8

IPv6 Configuration

☐ DHCP

☐ Auto Config

☒ Static

IPv6 Address

Link Local Address

FE80::204:8AFF:FE69:62B9

IPv6 Gateway

IPv6 DNS Server

802.1X

☐ Use 802.1X Security

Authentication

MDS

Username

Password

☐ Top

PC3

Physical Config Desktop Programming Attributes

☒ DHCP

☐ Static

DHCP request successful.

IP Address

172.29.1.6

Subnet Mask

255.255.255.0

Default Gateway

172.29.1.1

DNS Server

8.8.8.8

IPv6 Configuration

☐ DHCP

☐ Auto Config

☒ Static

IPv6 Address

Link Local Address

FE80::290:CFF:FEDD:84D6

IPv6 Gateway

IPv6 DNS Server

802.1X

☐ Use 802.1X Security

Authentication

MDS

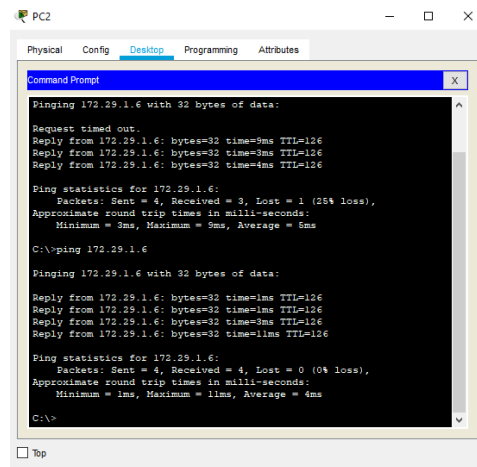
Username

Password

☐ Top

Se comprueba haciendo ping entre los equipos

PC2-PC3



```
Physical  Config  Desktop  Programming  Attributes
Command Prompt

Pinging 172.29.1.6 with 32 bytes of data:

Request timed out.
Reply from 172.29.1.6: bytes=32 time=9ms TTL=126
Reply from 172.29.1.6: bytes=32 time=3ms TTL=126
Reply from 172.29.1.6: bytes=32 time=4ms TTL=126

Ping statistics for 172.29.1.6:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 3ms, Maximum = 9ms, Average = 5ms

C:\>ping 172.29.1.6

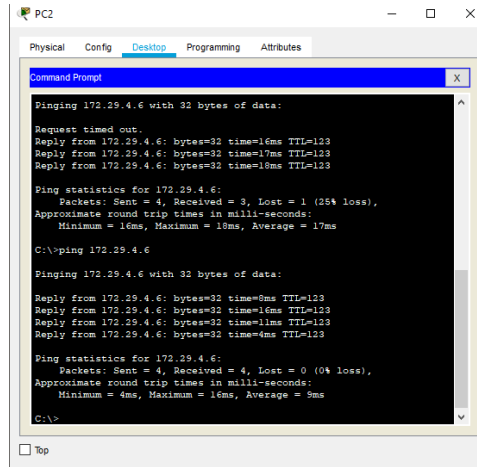
Pinging 172.29.1.6 with 32 bytes of data:

Reply from 172.29.1.6: bytes=32 time=1ms TTL=126
Reply from 172.29.1.6: bytes=32 time=1ms TTL=126
Reply from 172.29.1.6: bytes=32 time=3ms TTL=126
Reply from 172.29.1.6: bytes=32 time=1ms TTL=126

Ping statistics for 172.29.1.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 11ms, Average = 4ms

C:\>
```

PC2-PC0



```
Physical  Config  Desktop  Programming  Attributes
Command Prompt

Pinging 172.29.4.6 with 32 bytes of data:

Request timed out.
Reply from 172.29.4.6: bytes=32 time=16ms TTL=123
Reply from 172.29.4.6: bytes=32 time=17ms TTL=123
Reply from 172.29.4.6: bytes=32 time=18ms TTL=123

Ping statistics for 172.29.4.6:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 16ms, Maximum = 18ms, Average = 17ms

C:\>ping 172.29.4.6

Pinging 172.29.4.6 with 32 bytes of data:

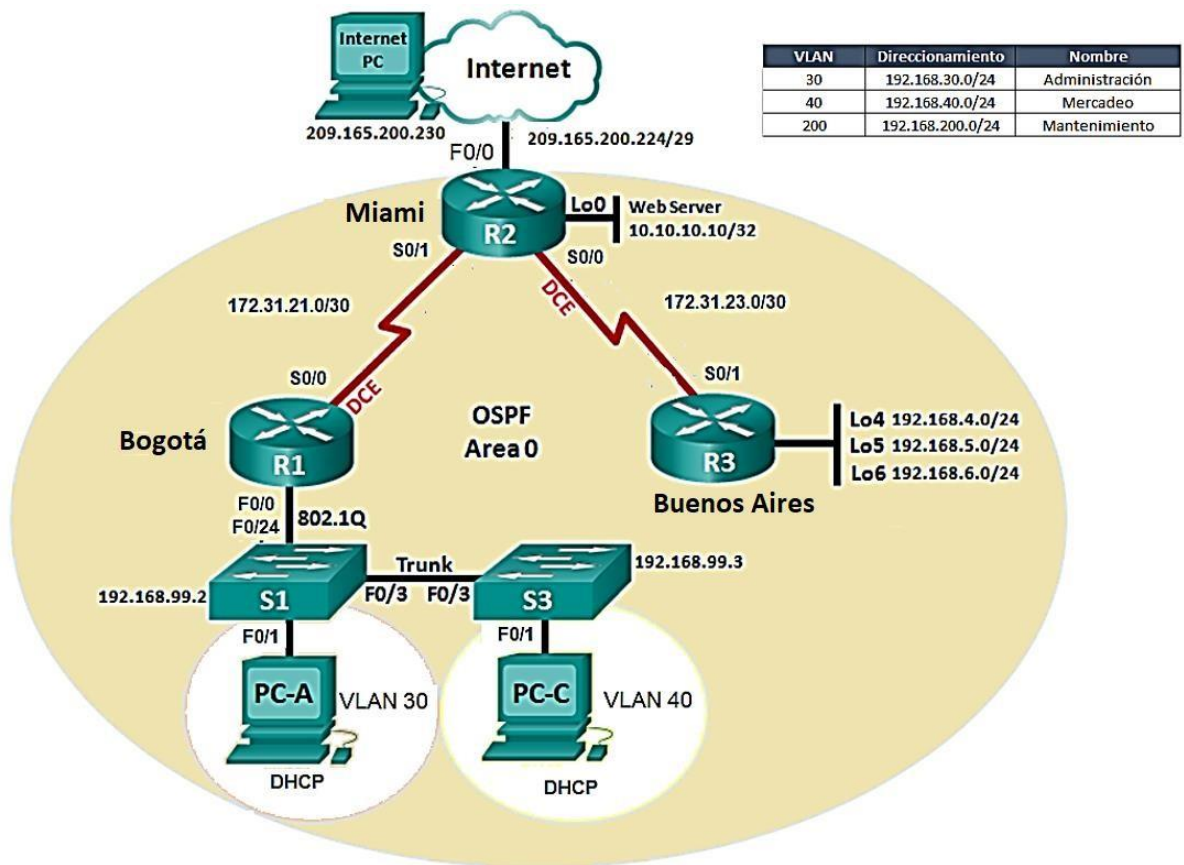
Reply from 172.29.4.6: bytes=32 time=8ms TTL=123
Reply from 172.29.4.6: bytes=32 time=16ms TTL=123
Reply from 172.29.4.6: bytes=32 time=11ms TTL=123
Reply from 172.29.4.6: bytes=32 time=4ms TTL=123

Ping statistics for 172.29.4.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 16ms, Average = 9ms

C:\>
```

1.3. ESCENARIO 2

Escenario: Una empresa de Tecnología posee tres sucursales distribuidas en las ciudades de Miami, Bogotá y Buenos Aires, en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre sí cada uno de los dispositivos que forman parte del escenario, acorde con los lineamientos establecidos para el direccionamiento IP, protocolos de enrutamiento y demás aspectos que forman parte de la topología de red.



1.4. DESARROLLO

1.4.1. Configurar el direccionamiento IP

Acorde con la topología de red para cada uno de los dispositivos que forman parte del escenario.

Dispositivo/Enlace	Dirección IP	Máscara de subred	Default Gateway	Dirección de IPV6	Gateway IPV6
Internet Server	209.165.200.230	255.255.255.248			
R1 -> R2 (S0/0)	172.31.21.1	255.255.255.252			
R2 -> R1 (S0/1)	172.31.21.2	255.255.255.252			
R2 -> R3 (S0/0)	172.31.23.1	255.255.255.252			
R3 -> R2 (S0/1)	172.31.23.2	255.255.255.252			
R2 -> Internet Server (G0/0)	209.165.200.225	255.255.255.248			
R2 -> Lo0 Web Server	10.10.10.10	255.255.255.255			
R3 -> Lo4	192.168.4.1	255.255.255.0			
R3 -> Lo5	192.168.5.1	255.255.255.0			
R3 -> Lo6	192.168.6.1	255.255.255.0			
S1 Vlan 30, Vlan 40 Vlan 200	192.168.99.2	255.255.255.0			
S3 Vlan 30, Vlan 40 Vlan 200	192.168.99.3	255.255.255.0			
R1 G0/0.30	192.168.30.1	255.255.255.0			
R1 G0/0.40	192.168.40.1	255.255.255.0			
R1 G0/0.200	192.168.200.1	255.255.255.0			

Configuración básica de los dispositivos: Se configuran routers y switches según topología y tabla de direccionamiento.

- Nombre
- exec password: class
- console access password: cisco
- telnet access password: cisco
- encriptación de contraseñas
- MOTD Banner “Solo personal autorizado”
- Deshabilitar DNS lookup en switches

Para R1

```
Router>en
Router#conf t
Enter configuration commands, one per line.          End with CNTL/Z.
Router(config)#hostname R1
R1(config)#no ip domain-lookup
R1(config)#enable secret class
R1(config)#line con 0 R1(config-
line)#password cisco R1(config-
line)#login R1(config-line)#line vty
0 4 R1(config-line)#password cisco
R1(config-line)#login R1(config-
line)#exit
R1(config)#service password-encryption R1(config)#banner
motd $ Solo personal autorizado $ R1(config)#
```

Para R2

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#no ip domain-lookup
R2(config)#enable secret class
R2(config)#line con 0 R2(config-
line)#password cisco R2(config-
line)#login R2(config-line)#exit
R2(config)#service password-encryption R2(config)#banner
motd $ Solo personal autorizado $ R2(config)#
```

Para R3

```
Router>en
Router#conf t
Enter configuration commands, one per line.           End with CNTL/Z.
Router(config)#hostname R3
R3(config)#no ip domain-lookup
R3(config)#enable secret class
R3(config)#line con 0 R3(config-
line)#password cisco R3(config-
line)#login R3(config-line)#line vty
0 4 R3(config-line)#password cisco
R3(config-line)#login R3(config-
line)#exit
R3(config)#service password-encryption R3(config)#banner
motd $ Solo personal autorizado $ R3(config)#
```

Configuración del “Internet PC”:

Internet PC

Physical Config **Desktop** Programming Attributes

☐ DHCP ☒ Static

IP Address: 209.165.200.230

Subnet Mask: 255.255.255.248

Default Gateway: 209.165.200.225

DNS Server: 0.0.0.0

IPv6 Configuration

☐ DHCP ☐ Auto Config ☒ Static

IPv6 Address: /

Link Local Address: FE80::20D:BDF:FE73:D60B

IPv6 Gateway:

IPv6 DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

1.4.2. Configurar el protocolo de enrutamiento OSPFv2

Bajo los siguientes criterios:

Configuration Item or Task	Specification
Router ID R1	1.1.1.1
Router ID R2	5.5.5.5
Router ID R3	8.8.8.8
Configurar todas las interfaces LAN como pasivas	
Establecer el ancho de banda para enlaces seriales en	256 Kb/s
Ajustar el costo en la métrica de S0/0 a	9500

En R1

```
R1>en
Password:
R1#conf t
Enter configuration commands, one per line.      End with CNTL/Z.
R1(config)#int s0/0/0
R1(config-if)#ip add 172.31.21.1 255.255.255.252
R1(config-if)#clock rate 64000
R1(config-if)#no shu

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R1(config-if)#
R1(config-if)#exit
R1(config)#router ospf 1
R1(config-router)#router-id 1.1.1.1
R1(config-router)#network 192.168.99.0 0.0.0.255 area 0
R1(config-router)#network 172.31.21.0 0.0.0.3 area 0
R1(config-router)#passive-interface f0/0
R1(config-router)#int s0/0/0
R1(config-if)#bandwidth 256
R1(config-if)#ip ospf cost 9500
```

En R2

```
R2>en
Password:
R2#conf t
Enter configuration commands, one per line.      End with CNTL/Z.
R2(config)#int S0/0/0
R2(config-if)#ip add 172.31.23.1 255.255.255.252
R2(config-if)#clock rate 64000
R2(config-if)#no shu

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R2(config-if)#int S0/0/1
R2(config-if)#ip add 172.31.21.2 255.255.255.252
R2(config-if)#no shu

R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

R2(config-if)#int loop0

R2(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R2(config-if)#ip add 10.10.10.10 255.255.255.255
R2(config-if)#no shu
R2(config-if)#
```

```

R2#conf t R2(config)#router
ospf 1
R2(config-router)#router-id 5.5.5.5
R2(config-router)#network 209.165.200.224 0.0.0.7 area 0
R2(config-router)#network 172.31.21.0 0.0.0.3 area 0
R2(config-router)#
03:59:29: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/0/1 from
LOADING to FULL, Loading Done

R2(config-router)#network 172.31.23.0 0.0.0.3 area 0
R2(config-router)#network 10.10.10.10 0.0.0.3 area 0
R2(config-router)#passive-interface f0/0
R2(config-router)#int s0/0/0
R2(config-if)#bandwidth 256
R2(config-if)#ip ospf cost 9500
R2(config-if)#int s0/0/1 R2(config-
if)#bandwidth 256 R2(config-if)#

```

En R3

```

R3>en
Password:
R3#conf t
Enter configuration commands, one per line.          End with CNTL/Z.
R3(config)#int loop4

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback4, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback4, changed state to up

R3(config-if)#ip add 192.168.4.1 255.255.255.0
R3(config-if)#int loop5

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback5, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback5, changed state to up

R3(config-if)#ip add 192.168.5.1 255.255.255.0
R3(config-if)#int loop6

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback6, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback6, changed state to up

R3(config-if)#ip add 192.168.6.1 255.255.255.0
R3(config-if)#

R3(config)#int s0/0/1
R3(config-if)#ip add 172.31.23.2 255.255.255.252
R3(config-if)#no shut

R3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

```

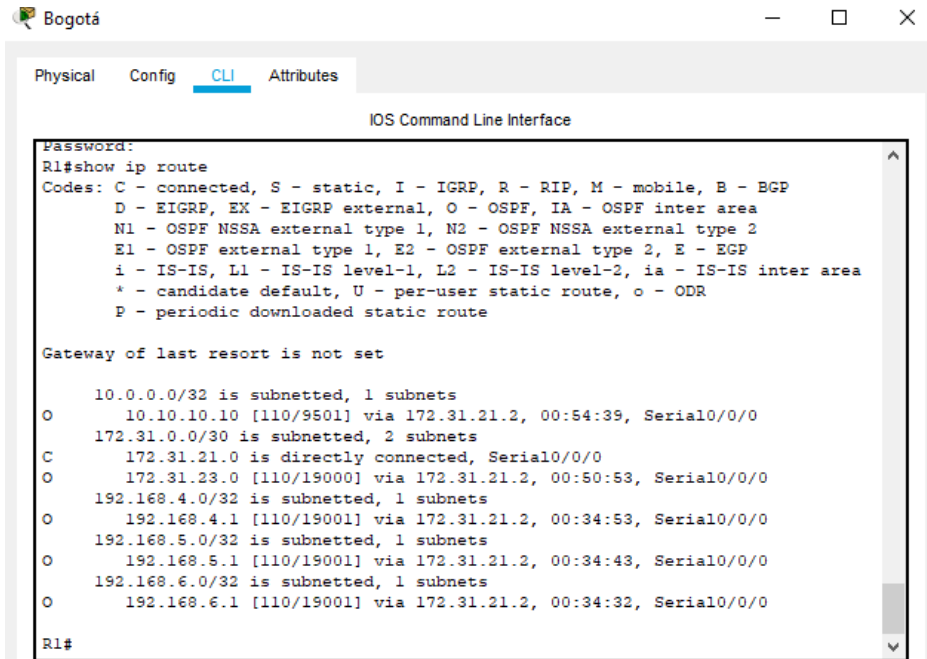
```

R3#conf t
Enter configuration commands, one per line.          End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#router-id 8.8.8.8
R3(config-router)#network 172.31.23.0 0.0.0.3 area 0
R3(config-router)#network 172.31.23.0 0.0.0.3 area 0
04:25:52: %OSPF-5-ADJCHG: Process 1, Nbr 5.5.5.5 on Serial0/0/1 f
R3(config-router)#network 192.168.4.0 0.0.0.255 area 0
R3(config-router)#network 192.168.5.0 0.0.0.255 area 0
R3(config-router)#network 192.168.6.0 0.0.0.255 area 0
R3(config-router)#int s0/0/0
R3(config-if)#bandwidth 256
R3(config-if)#ip ospf cost 9500
R3(config-if)#int s0/0/1 R3(config-
if)#bandwidth 256 R3(config-if)#ip
ospf cost 9500 R3(config-if)#

```

Verificar información de OSPF

- Visualizar tablas de enrutamiento y routers conectados por OSPFv2



```

Bogotá
Physical Config CLI Attributes
IOS Command Line Interface
Password:
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route

Gateway of last resort is not set

    10.0.0.0/32 is subnetted, 1 subnets
O       10.10.10.10 [110/9501] via 172.31.21.2, 00:54:39, Serial0/0/0
    172.31.0.0/30 is subnetted, 2 subnets
C       172.31.21.0 is directly connected, Serial0/0/0
O       172.31.23.0 [110/19000] via 172.31.21.2, 00:50:53, Serial0/0/0
    192.168.4.0/32 is subnetted, 1 subnets
O       192.168.4.1 [110/19001] via 172.31.21.2, 00:34:53, Serial0/0/0
    192.168.5.0/32 is subnetted, 1 subnets
O       192.168.5.1 [110/19001] via 172.31.21.2, 00:34:43, Serial0/0/0
    192.168.6.0/32 is subnetted, 1 subnets
O       192.168.6.1 [110/19001] via 172.31.21.2, 00:34:32, Serial0/0/0
R1#

```

Buenos Aires

Physical Config CLI Attributes

IOS Command Line Interface

```
R3>class
Translating "class"
% Unknown command or computer name, or unable to find computer address

R3>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route

Gateway of last resort is not set

    10.0.0.0/32 is subnetted, 1 subnets
O       10.10.10.10 [110/9501] via 172.31.23.1, 00:53:23, Serial0/0/1
    172.31.0.0/30 is subnetted, 2 subnets
O       172.31.21.0 [110/9890] via 172.31.23.1, 00:53:23, Serial0/0/1
C       172.31.23.0 is directly connected, Serial0/0/1
C       192.168.4.0/24 is directly connected, Loopback4
C       192.168.5.0/24 is directly connected, Loopback5
C       192.168.6.0/24 is directly connected, Loopback6

R3>
```

Miami

Physical Config CLI Attributes

IOS Command Line Interface

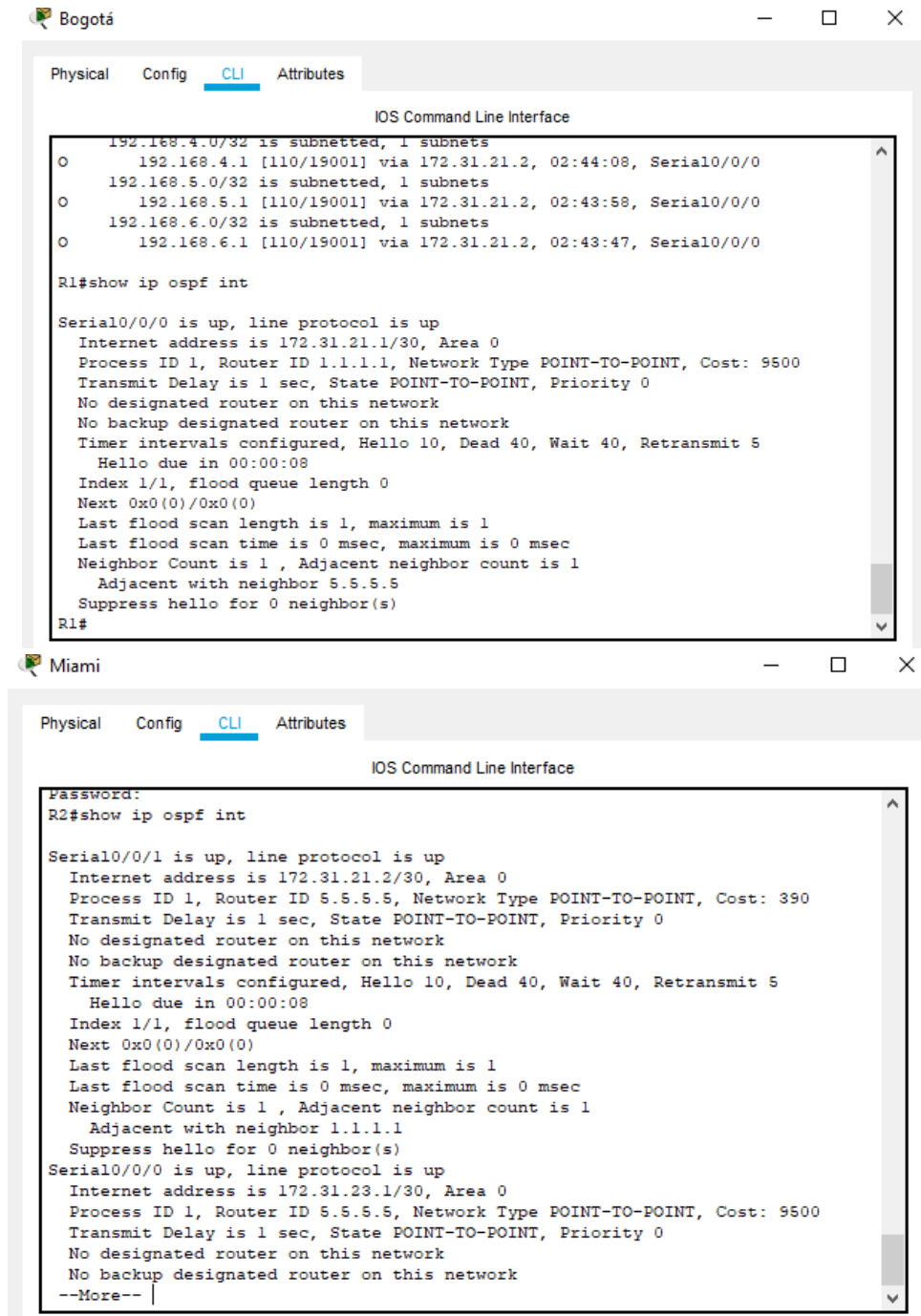
```
Password:
R2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route

Gateway of last resort is not set

    10.0.0.0/32 is subnetted, 1 subnets
C       10.10.10.10 is directly connected, Loopback0
    172.31.0.0/30 is subnetted, 2 subnets
C       172.31.21.0 is directly connected, Serial0/0/1
C       172.31.23.0 is directly connected, Serial0/0/0
    192.168.4.0/32 is subnetted, 1 subnets
O       192.168.4.1 [110/9501] via 172.31.23.2, 00:50:32, Serial0/0/0
    192.168.5.0/32 is subnetted, 1 subnets
O       192.168.5.1 [110/9501] via 172.31.23.2, 00:50:22, Serial0/0/0
    192.168.6.0/32 is subnetted, 1 subnets
O       192.168.6.1 [110/9501] via 172.31.23.2, 00:50:11, Serial0/0/0

R2#
```

- Visualizar lista resumida de interfaces por OSPF en donde se ilustre el costo de cada interface.



The image displays two screenshots of a network simulator interface, showing the configuration and status of OSPF interfaces on two routers: Bogotá and Miami.

Bogotá Router:

- The CLI shows the configuration of four interfaces (Serial0/0/0, Serial0/0/1, Serial0/0/2, Serial0/0/3) with IP addresses in the 192.168.4.0/32, 192.168.5.0/32, 192.168.6.0/32, and 192.168.7.0/32 ranges.
- The command `R1#show ip ospf int` is executed, showing the status of the interfaces.
- The output for Serial0/0/0 is displayed, showing it is up and configured with IP 172.31.21.1/30, Area 0, and a cost of 9500.

Miami Router:

- The CLI shows the configuration of two interfaces (Serial0/0/0, Serial0/0/1) with IP addresses in the 172.31.21.2/30 and 172.31.21.3/30 ranges.
- The command `R2#show ip ospf int` is executed, showing the status of the interfaces.
- The output for Serial0/0/1 is displayed, showing it is up and configured with IP 172.31.21.2/30, Area 0, and a cost of 390.
- The output for Serial0/0/0 is displayed, showing it is up and configured with IP 172.31.21.3/30, Area 0, and a cost of 9500.

Buenos Aires

Physical Config CLI Attributes

IOS Command Line Interface

```

Password:
R3#show ip ospf int

Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.23.2/30, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type POINT-TO-POINT, Cost: 9500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:06
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 5.5.5.5
  Suppress hello for 0 neighbor(s)
Loopback4 is up, line protocol is up
  Internet address is 192.168.4.1/24, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
Loopback5 is up, line protocol is up
  Internet address is 192.168.5.1/24, Area 0
--More--

```

- Visualizar el OSPF Process ID, Router ID, Address summarizations, Routing Networks, and passive interfaces configuradas en cada router.

Bogotá

Physical Config CLI Attributes

IOS Command Line Interface

```

Password:
R1>en
Password:
R1#show ip pro

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 1.1.1.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    192.168.99.0 0.0.0.255 area 0
    172.31.21.0 0.0.0.3 area 0
  Passive Interface(s):
    FastEthernet0/0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:11:45
    5.5.5.5          110          00:15:28
    8.8.8.8          110          00:11:30
  Distance: (default is 110)

R1#

```

Miami

Physical Config CLI Attributes

IOS Command Line Interface

```
R2>en
Password:
R2#show ip pro

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 5.5.5.5
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    209.165.200.224 0.0.0.7 area 0
    172.31.21.0 0.0.0.3 area 0
    172.31.23.0 0.0.0.3 area 0
    10.10.10.8 0.0.0.3 area 0
  Passive Interface(s):
    FastEthernet0/0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:13:28
    5.5.5.5          110          00:17:10
    8.8.8.8          110          00:13:12
  Distance: (default is 110)

R2#
```

Buenos Aires

Physical Config CLI Attributes

IOS Command Line Interface

```
Password:
R3>en
Password:
R3#show ip pro

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 8.8.8.8
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.23.0 0.0.0.3 area 0
    192.168.4.0 0.0.0.255 area 0
    192.168.5.0 0.0.0.255 area 0
    192.168.6.0 0.0.0.255 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:16:33
    5.5.5.5          110          00:20:15
    8.8.8.8          110          00:16:17
  Distance: (default is 110)

R3#
```


1.4.3. Configurar VLANs,

Puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN Routing y Seguridad en los Switches acorde a la topología de red establecida.

1.4.4. En el Switch 3 deshabilitar DNS lookup.

1.4.5. Asignar direcciones IP a los Switches

Acorde a los lineamientos.

En S1

```
Switch>en
Switch#conf t
Enter configuration commands, one per line.      End with CNTL/Z.
Switch(config)#hostname S1
S1(config)#enable secret class
S1(config)#line con 0 S1(config-
line)#password cisco S1(config-
line)#login S1(config-line)#exit
S1(config)#service password-encryption S1(config)#banner
motd $ Solo personal autorizado $ S1(config)#
```

```
S1#conf t
Enter configuration commands, one per line.      End with CNTL/Z.
S1(config)#vlan 30
S1(config-vlan)#name Administracion
S1(config-vlan)#vlan 40
S1(config-vlan)#name Mercadeo
S1(config-vlan)#vlan 200
S1(config-vlan)#name Mantenimiento
S1(config-vlan)#exit
```

```

S1(config)#int f0/3
S1(config-if)#switchport mode trunk

S1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state
to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state
to up

S1(config-if)#switchport trunk native vlan 1
S1(config-if)#int f0/24
S1(config-if)#switchport mode trunk S1(config-
if)#switchport trunk native vlan 1 S1(config-if)#no
shut
S1(config-if)#switchport trunk native vlan 1 S1(config-
if)#int range f0/1-2, f0/4-24, g0/1-2 S1(config-if-
range)#switchport mode access S1(config-if-
range)#exit
S1(config)#int f0/1
S1(config-if)#switchport mode access S1(config-
if)#switchport access vlan 30 S1(config-if)#int range
f0/2, f0/4-24, g0/1-2 S1(config-if-range)#shutdown

```

```

S1(config)#int vlan 200
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed state to up

S1(config-if)#ip add 192.168.99.2 255.255.255.0
S1(config-if)#

```

En S3

```

Switch>en
Switch#conf t
Enter configuration commands, one per line.          End with CNTL/Z.
Switch(config)#hostname S3
S3(config)#no ip domain-lookup
S3(config)#enable secret class
S3(config)#line con 0 S3(config-
line)#password cisco S3(config-
line)#login S3(config-line)#exit
S3(config)#service password-encryption S3(config)#banner
motd $ Solo personal autorizado $ S3(config)#

```

```

S3#conf t
Enter configuration commands, one per line.      End with CNTL/Z.
S3(config)#vlan 30
S3(config-vlan)#name Administracion
S3(config-vlan)#vlan 40
S3(config-vlan)#name Mercadeo
S3(config-vlan)#vlan 200
S3(config-vlan)#name Mantenimiento
S3(config-vlan)#exit

```

```

S3(config)#int vlan 200
S3(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed state to up

S3(config-if)#ip add 192.168.99.3 255.255.255.0
S3(config-if)#exit
S3(config)#ip default-gateway 192.168.99.1
S3(config)#int f0/3
S3(config-if)#switchport mode trunk S3(config-
if)#switchport trunk native vlan 1
S3(config-if)#int range f0/1-2, f0/4-24, g0/1-2
S3(config-if-range)#switchport mode access S3(config-
if-range)#exit
S3(config)#int f0/1
S3(config-if)#switchport mode access S3(config-
if)#switchport access vlan 40 S3(config-if)#int range
f0/2, f0/4-24, g0/1-2 S3(config-if-range)#shutdown

```

Direccionamiento Web Server

Web Server

Physical Config Services **Desktop** Programming Attributes

☐ DHCP ☒ Static

IP Address: 10.10.10.10

Subnet Mask: 255.255.255.0

Default Gateway: 10.10.10.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ DHCP ☐ Auto Config ☒ Static

IPv6 Address: /

Link Local Address: FE80::201:C9FF:FE2D:4ADD

IPv6 Gateway:

IPv6 DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

1.4.6. Desactivar todas las interfaces que no sean utilizadas en el esquema de red.

1.4.7. Implementar DHCP and NAT for IPv4

1.4.8. Configurar R1 como servidor DHCP para las VLANs 30 y 40.

1.4.9. Reservar las primeras 30 direcciones IP de las VLAN 30 y 40 para configuraciones estáticas.

Configurar DHCP pool para VLAN 30	Name: ADMINISTRACION DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.
Configurar DHCP pool para VLAN 40	Name: MERCADEO DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.

1.4.10. Configurar NAT en R2 para permitir que los host puedan salir a internet.

1.4.11. Configurar al menos dos listas de acceso de tipo estándar
A su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.

1.4.12. Configurar al menos dos listas de acceso de tipo extendido
Nombradas a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.

1.4.13. Verificar procesos de comunicación y redireccionamiento de tráfico en los routers

Mediante el uso de Ping y Traceroute.

```
R1#conf t
Enter configuration commands, one per line.          End with CNTL/Z.
R1(config)#int f0/0.30
R1(config-subif)#description accounting LAN
R1(config-subif)#encapsulation dot1q 30
R1(config-subif)#ip add 192.168.30.1 255.255.255.0
R1(config-subif)#int f0/0.40
R1(config-subif)#description accounting LAN
R1(config-subif)#encapsulation dot1q 40
R1(config-subif)#ip add 192.168.40.1 255.255.255.0
R1(config-subif)#int f0/0.200
R1(config-subif)#description accounting LAN
R1(config-subif)#encapsulation dot1q 200
R1(config-subif)#ip add 192.168.200.1 255.255.255.0
R1(config-subif)#int f0/0
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.30, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.40, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.200, changed state to up
```

```
R1>en
Password:
R1#conf t
Enter configuration commands, one per line.          End with CNTL/Z.
R1(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.30
R1(config)#ip dhcp pool vlan30
R1(dhcp-config)#network 192.168.30.0 255.255.255.0
R1(dhcp-config)#default-router 192.168.30.1
R1(dhcp-config)#dns-server 10.10.10.11
R1(dhcp-config)#domain-name ccna-unad.com
R1(dhcp-config)#
```

```
R1(config)#ip dhcp excluded-address 192.168.40.1 192.168.40.30
R1(config)#ip dhcp pool vlan40
R1(dhcp-config)#network 192.168.40.0 255.255.255.0
R1(dhcp-config)#default-router 192.168.40.1
R1(dhcp-config)#dns-server 10.10.10.11
R1(dhcp-config)#domain-name ccna-unad.com
R1(dhcp-config)#
```

PC-A

Physical Config **Desktop** Programming Attributes

☒ DHCP ☐ Static DHCP request successful.

IP Address	192.168.30.31
Subnet Mask	255.255.255.0
Default Gateway	192.168.30.1
DNS Server	10.10.10.11

PC-C

Physical Config **Desktop** Programming Attributes

☒ DHCP ☐ Static DHCP request successful.

IP Address	192.168.40.31
Subnet Mask	255.255.255.0
Default Gateway	192.168.40.1
DNS Server	10.10.10.11

```

R2(config)# ip nat pool INTERNET 209.165.200.225 209.165.200.230 netmask
255.255.255.248
R2(config)#access-list 1 permit 192.168.0.0 0.0.255.255
R2(config)#ip nat inside source list 1 pool INTERNET
R2(config)#int s0/0/1
R2(config-if)#ip nat inside
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to
down

02:02:17: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/0/1 from FULL to
DOWN, Neighbor Down: Interface down or detached

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to
down

02:02:17: %OSPF-5-ADJCHG: Process 1, Nbr 8.8.8.8 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Interface down or detached

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

R2(config-if)#
02:02:27: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/0/1 from
LOADING to FULL, Loading Done

02:02:27: %OSPF-5-ADJCHG: Process 1, Nbr 8.8.8.8 on Serial0/0/0 from
LOADING to FULL, Loading Done

R2(config-if)#exit R2(config)#int
f0/0 R2(config-if)#ip nat outside
R2(config-if)#exit R2(config)#

```

Ping desde PC-A

```

C:\>ping 209.165.200.230

Pinging 209.165.200.230 with 32 bytes of data:

Request timed out.
Reply from 209.165.200.230: bytes=32 time=11ms TTL=126
Reply from 209.165.200.230: bytes=32 time=1ms TTL=126
Reply from 209.165.200.230: bytes=32 time=1ms TTL=126

Ping statistics for 209.165.200.230:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 11ms, Average = 4ms

C:\>tracert 209.165.200.230

Tracing route to 209.165.200.230 over a maximum of 30 hops:

  0  0 ms    1 ms     0 ms     192.168.30.1
  1  1 ms    0 ms     0 ms     172.31.21.2
  2  0 ms    1 ms     1 ms     209.165.200.230

Trace complete.

```

De PC1 a LOOPBACK 4, 5 Y 6

```
Reply from 192.168.6.1: bytes=32 time=2ms TTL=253
Reply from 192.168.6.1: bytes=32 time=2ms TTL=253
Reply from 192.168.6.1: bytes=32 time=3ms TTL=253
Reply from 192.168.6.1: bytes=32 time=2ms TTL=253

Ping statistics for 192.168.6.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 3ms, Average = 2ms

C:\>ping 192.168.5.1

Pinging 192.168.5.1 with 32 bytes of data:

Reply from 192.168.5.1: bytes=32 time=3ms TTL=253
Reply from 192.168.5.1: bytes=32 time=2ms TTL=253
Reply from 192.168.5.1: bytes=32 time=2ms TTL=253
Reply from 192.168.5.1: bytes=32 time=2ms TTL=253

Ping statistics for 192.168.5.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 3ms, Average = 2ms

C:\>ping 192.168.4.1

Pinging 192.168.4.1 with 32 bytes of data:

Reply from 192.168.4.1: bytes=32 time=3ms TTL=253
Reply from 192.168.4.1: bytes=32 time=2ms TTL=253
Reply from 192.168.4.1: bytes=32 time=2ms TTL=253
Reply from 192.168.4.1: bytes=32 time=2ms TTL=253

Ping statistics for 192.168.4.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 3ms, Average = 2ms
```


De PC1 a LOOPBACK 0

```
C:\>ping 10.10.10.10

Pinging 10.10.10.10 with 32 bytes of data:

Reply from 10.10.10.10: bytes=32 time=2ms TTL=254
Reply from 10.10.10.10: bytes=32 time=1ms TTL=254
Reply from 10.10.10.10: bytes=32 time=1ms TTL=254
Reply from 10.10.10.10: bytes=32 time=4ms TTL=254

Ping statistics for 10.10.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 4ms, Average = 2ms

C:\>TRACERT 10.10.10.10

Tracing route to 10.10.10.10 over a maximum of 30 hops:

  0  0 ms    0 ms    0 ms    192.168.30.1
  1  1 ms    0 ms    0 ms    10.10.10.10
  2  0 ms    0 ms    0 ms    10.10.10.10

Trace complete.
```

2. CONCLUSIONES

- Al configurar el direccionamiento IP de acuerdo a la topología de red para cada escenario dado se deben escoger con minuciosidad los elementos a emplear según las necesidades, garantizando primeramente que las características físicas de cada dispositivo satisfagan las necesidades planteadas, así mismo se debe prestar especial atención a la asignación de las IP's pues esto es la base de los ejercicios planteados.
- En cada práctica planteada durante el curso y en estas habilidades siempre se enfatizó en la necesidad de asegurar el acceso a las redes mediante claves y contraseñas, aspecto fundamental en el ejercicio de la profesión.
- La consolidación y verificación de conceptos como NAT, PAT, OSPF, DHCP ha sido bastante provechosa en el desarrollo de estas habilidades prácticas, pues son conceptos fundamentales en el diseño de redes.
- La destreza en el manejo de herramientas de simulación resulta fundamental en el futuro ejercicio de la profesión ingenieril, pues estos entornos nos brindan la posibilidad de analizar diversas variables que puedan afectar diferentes diseños de redes.
- La alianza establecida entre la UNAD y CISCO sin lugar a dudas hace que el conocimiento adquirido sea mucho más enriquecedor y de gran utilidad para el ejercicio de la profesión.

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